Eaton 9PX UPS

5-11 kVA Rack/Tower

Guide Specification

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1.1 Summary

This specification describes a continuous-duty, online, solid state uninterruptible power system, hereafter referred to as the UPS. The UPS shall operate in conjunction with the existing building electrical system to protect electronic equipment from power disturbances that may occur in utility power such as voltage fluctuations, brown-outs and blackouts, power surges and sags. The UPS shall provide high-quality AC power for sensitive electronic equipment loads.

1.2 Standards

The UPS shall be designed in accordance with applicable sections of the current revision of the following documents.

- IEC/EN 60950-1
- IEC/EN 62040-1 (UPS Safety)
- IEC/EN 62040-2 (UPS EMC)
- IEC/EN 62040-3 (UPS Performance)
- IEC 61000-6-2 (Immunity in industrial environment)
- IEC 61000-6-4 (Emission in industrial environment)
- IEC 61000-4-1 (Overview of IEC 61000-4 series)
- UL 1778 (UPS for USA)
- CSA C22.2 (UPS for Canada)

1.3 System Description

1.3.1 Modes of Operation

The UPS shall operate as an online double-conversion UPS with the following modes:

A. Normal mode: The rectifier shall derive power as needed from the commercial AC utility or generator source and supply filtered and regulated DC power to the online inverter. The inverter shall convert the DC power at its input to highly regulated and filtered AC power for the critical loads.

B. High efficiency mode: In the presence of favorable incoming utility conditions, the UPS shall optimize its operating state to maximize its efficiency (user selectable).

C. Battery mode: Upon complete failure of utility power, the UPS shall provide power to the critical loads through the inverter, from the internal or extended batteries. When utility power returns, the unit shall return to Normal operation.

D. Bypass mode: The automatic bypass shall transfer the critical load to the commercial AC source, bypassing the UPS's inverter/rectifier, in the case of an overload, load fault or internal failure.

E. Standby mode: When initially attached to a utility or other power source, the UPS shall start in standby mode until the user initiates power to the critical load. In this mode, the UPS shall recharge the batteries, but power shall not be supplied to the critical load.

1.3.2 Design Requirements

A. Inverter Output

1. Maximum power ratings: (VA / W / Power factor)
    a. 5 kVA:
        - 5000 VA / 4500W / 0.9
    b. 6 kVA:
        - 240V: 6000 VA / 5400W / 0.9
        - 230V: 6000 VA / 5400W / 0.9
        - 220V: 5700 VA / 5100W / 0.89
        - 208V: 5400 VA / 4800W / 0.89
        - 200V: 5200 VA / 4600W / 0.88
    c. 8 kVA:
        - 8000 VA / 7200W / 0.9
    d. 11 kVA:
        - 240V: 11000 VA / 10000W / 0.91
        - 230V: 11000 VA / 10000W / 0.91
        - 220V: 11000 VA / 9900W / 0.9
        - 208V: 10000 VA / 9000W / 0.9
        - 200V: 10000 VA / 9000W / 0.9
        - 250V: 10000 VA / 9000W / 0.9

2. Nominal output voltage (user selectable):
    a. 5-6 kVA: 208 Vac (Default) /200/220/230/240 Vac
    b. 8-11 kVA: 208 Vac (Default) /200/220/230/240/250 Vac
3. Efficiency (full load):
    a. 5-6 kVA: ≥93% w/resistive load
    b. 8-11 kVA: ≥94% w/resistive load
4. Current overload capability:
    a. The UPS shall attempt to clear overloads while remaining on inverter in normal operation (IT Mode) before transferring to bypass.
    b. Bypass transfer thresholds:
        - 2 min 102-110%
        - 1 min 110-125%
        - 10 seconds 125-150%
        - 500 ms >150% for 5-6 kVA models

- 900 ms >150% for 8-11 kVA models

5. Waveform: Pure sine wave
6. Voltage regulation: ±1% steady state
7. Output voltage distortion THDV%:
    a. Linear load: <2% linear load
    b. Nonlinear load: <5% (IEC 62040-3 reference)
8. Dynamic voltage regulation:
    a. 20% → 100% → 20% R load step: ±6%
    b. 0% → 100 → 0% R load step: ±9%
9. Recovery time (up to 90% voltage recovery):
    a. 0% → 100 → 0% nonlinear load step: 100ms
10. nonlinear load (IEC 62040-3 reference) step
11. Transient response:
    a. IEC 62040-3 Classification 1 (test method defined by IEC 62040-3 for R load and nonlinear load)

B. System Input
1. Input voltage range
    a. Full load input voltage range*:

Nominal Voltage	Input Voltage Range
200V	160-230V
208V	168-242V
220V	176-253V
230V	187-264V
240V	192-276V
250V (8-11 kVA only)	200-276V

* Range given is for operating when bypass is within tolerance.

    b. Input voltage range at ≤40% load: 100-276V
2. Input voltage hysteresis: Low +10V / High -10V
3. Frequency – 50/60 Hz
    a. Auto sensing upon initial startup
    b. Selectable through front menu
4. Frequency range
    a. 50 Hz: 40-60 Hz
    b. 60 Hz: 50-70 Hz
5. Frequency hysteresis: Low +0.5 Hz / High -0.5 Hz
6. Input power factor: ≥0.99
7. Input current distortion, THDi%: <5% at nominal input voltage, full load and battery fully charged

C. Batteries and Charger
1. Battery type: Valve Regulated Lead Acid (VRLA), non-spillable, lead acid cells, maintenance free
2. Extended runtime: The UPS shall have capability for addition of extra battery modules (EBMs) to increase total runtime. Refer to Tables 1.3.2.C.b.i and ii for

runtimes. Battery times are approximate and vary depending on load configuration and battery charge.

i. 5-6 kVA battery runtimes

Load (Watts)	1 EBM	2 EBM	3 EBM	4 EBM	5 EBM
5400	3	16	28	47	58
4050	4.5	24	45	62	90
2700	8.5	38	71	104	133
1350	22	85	147	214	287
540	57	203	399	554	755

ii. 8-11 kVA battery runtimes

Load (Watts)	1 EBM	2 EBM	3 EBM	4 EBM	5 EBM	6 EBM
10000	3	10	18	25	34	42
7500	5.5	15	25	37	48	61
5000	10	25	42	61	80	98
2500	25	60	97	136	163	184
1000	74	159	237	341	461	541

3. Battery replacement – Hot-swappable internal batteries
4. Advanced Battery Management – The UPS will provide Advanced Battery Management that uses sophisticated sensing circuitry and a three-stage charging technique that extends the used service life of the UPS batteries while optimizing the battery recharge time. Additionally, the UPS should be able to provide up to 60 days' notice of the end of useful battery service life to aid in scheduling of battery replacement.
5. Auto Battery Test – If customer does not use Advanced Battery Management and uses a constant charging mode, the UPS will perform an auto battery test with a factory default set at once per week to determine the overall health of the battery. This interval should be settable to select either no test, every day, every week, or every month.

D. Form Factor

1. The UPS shall be able to be used in both rack and tower applications.
2. The front LCD menu shall be able to rotate 90 degrees so that the front menu displays in both a rack and tower form factor.
3. Rack mounting: The transformer shall ship with a 4-post rail kit and mount in a 4-post, 19-inch enclosure.
4. The UPS shall ship with pedestal feet to stabilize the UPS in the tower form factor.

E. Bundled Solutions

1. The manufacturer shall offer bundles in order to ship the UPS and accessories under one part number. All UPSs shall come with a network management card as standard. Bundles will also be available to provide unique accessories for bypass and output distribution in order to provide a tailored solution.

a. 5-6 kVA recommended bundle(s):

Catalog Number	Power Rating (VA/Watts)	Input connection	Output receptacles	Dimensions H x W x D, in.
208V, 50/60 Hz				
9PX5K	5000/4500	L6-30P	(2) L6-30R, (2) L6-20R	5.1 (3U) x 17.3 x 28.4
9PX6K	6000/5400	L6-30P	(2) L6-30R, (2) L6-20R	5.1 (3U) x 17.3 x 28.4
9PX6KG	6000/5400	Hardwired	(2) C19, (8) C13	5.1 (3U) x 17.3 x 27.0
120V/208V, 50/60 Hz				
9PX5KTF5	5000/4500	L6-30P	(1) L6-30R, (2) L6-20R, (18) 5-20R	10.2 (6U) x 17.3 x 28.4
9PX5KP1	5000/4500	L6-30P	(1) L14-30R, (1) L6-30R, (6) 5-20R	10.2 (6U) x 17.3 x 28.4
9PX5KP2	5000/4500	Hardwired	Hardwired	10.2 (6U) x 17.3 x 28.4
9PX6KTF5	6000/5400	L6-30P	(1) L6-30R, (2) L6-20R, (18) 5-20R	10.2 (6U) x 17.3 x 28.4
9PX6KP1	6000/5400	L6-30P	(1) L14-30R, (1) L6-30R, (6) 5-20R	10.2 (6U) x 17.3 x 28.4
9PX6KP2	6000/5400	Hardwired	Hardwired	10.2 (6U) x 17.3 x 28.4

b. 8-11 kVA recommended bundle(s):

Catalog Number	Power Rating (VA/Watts)	Input connection	Output receptacles	Dimensions H x W x D, in.
208V, 50/60 Hz				
9PX8KHW	8000/7200	Hardwired	Hardwired	10.2 (6U) x 17.3 x 27.6
9PX8K	8000/7200	Hardwired	Hardwired, (3) L6-30R	10.2 (6U) x 17.3 x 30.0
9PX11KHW	11000/10000	Hardwired	Hardwired	10.2 (6U) x 17.3 x 27.6
9PX11K	11000/10000	Hardwired	Hardwired, (3) L6-30R	10.2 (6U) x 17.3 x 30.0
120V/208V, 50/60 Hz				
9PX8KTF5	8000/7200	Hardwired	Hardwired, (2) L6-30R, (18) 5-20R	15.3 (9U) x 17.3 x 30.0
9PX11KTF5	11000/10000	Hardwired	Hardwired, (2) L6-30R, (18) 5-20R	15.3 (9U) x 17.3 x 30.0
9PX11KTF11	11000/10000	Hardwired	Hardwired, (2) L14-30R, (8) 5-20R	15.3 (9U) x 17.3 x 27.6

1.3.3 Display and Controls

A. Local display:
   1. The UPS shall be provided with a full graphical LCD display that provides the information and access to all settings and control features of the UPS.
   2. The main status screen shall include all the following information at a single view:
      a. UPS mode status
      b. Load information:
         - Load wattage
         - Load VA
         - Load percentage
         - Graphical representation of load %
      c. Battery Condition
         - Battery charge percentage
         - Estimated runtime
         - Number of EBMs connected
         - Graphical representation of battery %
      d. Alert / Alarm conditions
      e. Efficiency

B. User menu:
   1. Controls will consist of a 5-button configuration including:
      - ESC – Exit menu item / cancel changes
      - UP – Go to previous screen or menu/value selection
      - DOWN – Go to next screen of menu/value selection
      - ENTER – Enter menu or select value
      - On/Off Button

1.3.4 Optional Accessories

A. External Maintenance Bypass (MBP): The UPS will have an option for a compatible MBP. The MBP shall provide a means to provide power to the critical load while isolating or removing the UPS for maintenance.
   1. Transfer: The MBP shall be a rotary type and Make-Before-Break type. There shall be no loss of power to the critical load during transition.
   2. MBP input:
      a. 5-6 kVA MBP: Hardwired input standard. An L6-30P input cord can be attached by a qualified electrician if needed.
      b. 8-11 kVA MBP: Hardwired input
   3. MBP output:
      a. 5-6 kVA MBP: (2) L6-30R or hardwired output
      b. 8-11 kVA MBP: (3) L6-30R or hardwired output
   4. Mounting: The MBP shall be able to mount in a 4-post, 19-inch enclosure or to the side of the UPS.

B. Step Down Transformer: The UPS shall have a transformer to step down 208V or 240V to 120V.

1. The transformer will be housed in a line-and-match cabinet that matches the appearance of the UPS.
2. The transformer shall provide galvanic isolation.
3. There shall a means for distributing power out of the transformer to the critical load:
    a. 5-6 kVA:
        i. (18) 5-20R, with (4) circuits of 20A 120V
    b. 8-11 kVA:
        ii. Hardwired terminal block - 120/240V output (L1, L2, N, G)
        iii. (2) L14-30R, with (2) circuits of 30A 120/240V
        iv. (8) 5-20R, with (2) circuits of 20A 120V
4. Rack mounting: The transformer shall ship with a 4-post rail kit and mount in a 4-post, 19-inch enclosure.

C. PowerPass Distribution Module (PPDM) for 5-6 kVA models: The UPS shall have an optional PPDM accessory that contains maintenance bypass, steps down voltage to 120V while also providing 204V output and includes output distribution.
    1. Maintenance bypass (MBP): The PPDM shall contain a rotary type MBP that is accessible through the front bezel. The MBP shall provide a means to provide power to the critical load while isolating or removing the UPS for maintenance.
    2. Output voltage: The PPDM shall provide 120/240V output. For sites with 208V input, there shall be a voltage selection switch to transform 208V to 120/240V.
    3. Output distribution: PPDMs shall have a means for distributing both 120V and 240V.
        a. 9PXPPDM1:
            i. (1) L14-30R
            ii. (1) L6-30R
            iii. (6) 5-20R with (2) circuits of 20A 120V
        b. 9PXPPDM2:
            i. Hardwired terminal block - 120/240V output (L1, L2, N, G)
    4. Rack mounting: The transformer shall ship with a 4-post rail kit and mount in a 4-post, 19-inch enclosure.

D. Battery integration system: The UPS shall have an available mounting kit for stacking multiple modules without the use of an IT rack. The system shall come equipped with (2) wheels and (2) casters as well as (4) leveling feet. The system shall allow for stacking of up to (8) 3U modules.

E. Optional 2-post rail kit (for 5-6 kVA models): There shall be an optional accessory to mount the 5-6 kVA UPS in a 2-post rack. The accessory shall also be able to work with EBMs and transformers.

1.3.5 Communications Option

A. Network Card
    1. UPS shall include one communications slot that will allow the operator to field install an network communications card [Eaton Network Card-MS or equivalent] which is supplied with the UPS. Minimum features are described below.

a. The network communications card must be hot-installable.
b. Communicates with SNMPv3 and IPv6
c. Supports IETF UPS MIB
d. Supports redundant UPS configurations
e. Allows control of UPS managed load segments
f. Manual and scheduled on/off controls of UPS
g. Capable of mass firmware upgrades
h. Capable for mass configuration

B. RS232 serial Communication
    1. The UPS will provide a RS232 serial connection. Cable provided to provide DB-9 interface.
C. USB
    1. The UPS will provide a USB connection that is HID compliant for network connection
D. RPO / ROO (Remote Power Off / Remote On/Off)
    1. The UPS will provide both Remote Power Off and Remote On/Off capability.
        a. Remote Power Off – Allow a remote contact to be used to disconnect power to the UPS and all devices attached. Restarting the UPS requires manual intervention.
        b. Remote On/Off – Allows remote contact to be used to turn the UPS On and Off. Resetting the contact to the normal position will automatically return the UPS back to normal state.

1.4 Management Software

The UPS will be compatible with power management software [Eaton Intelligent Power Software Suite (IPSS) or equivalent]. This software will perform the following actions:

- Monitors power consumption at the load segment level
- Support redundant UPS configuration
- Lightweight software, not running in JRE
- Performs mass configurations on alarms, alert notifications and shutdown parameters
- Mass update of network card firmware
- Plugs into dashboard of major Virtualization players. Allows for monitor of power equipment through the same dashboard that the Virtualized data center uses.
- Triggers movement of virtual machines to avoid shutdown of server facing imminent power disruption

1.5 Warranty

The UPS will have a warranty that covers both the UPS and the internal batteries for 2 years with product registration.

1.6 Environmental conditions

A. Operating temperature: 0 to 40°C (32°F to 104°F)
B. Storage temperature: 0 to 35°C (32°F to 95°F)
C. Storage temp less batt: -15 to 60°C (5°F to 140°F)
D. Relative humidity: 0 to 95%
E. Surge suppression: IEEE ANSI C62.41 Cat B2
F. Audible noise: <45 dB at 1 meter